

## CLAIMS:

- 1 1. A system for detecting neutron radiation comprising:
  - 2 a liquid cocktail mixture comprised of a neutron absorber and a scintillator,
  - 3 said cocktail mixture housed in a tube having a mirror at one end of the tube and a
  - 4 windowed portal at the other end of the tube such that neutrons that penetrate the
  - 5 tube react with the neutron absorber producing ionization that excites the scintillator
  - 6 and produces photons;
  - 7 a photo-multiplier tube coupled with the windowed portal for receiving the
  - 8 photons and converting the photons to electrical signals; and
  - 9 a processing device for receiving and analyzing the electrical signals so as to
  - 10 provide a measurement pertaining to the presence and relative strength of neutron
  - 11 radiation.
- 1 2. The system of claim 1 wherein the liquid cocktail mixture further comprises a
  - 2 wavelength shifter for converting light emitted by the scintillator to another
  - 3 wavelength.
- 1 3. The system of claim 2 wherein the tube is a Teflon<sup>®</sup> tube acting as a liquid light
  - 2 guide, the liquid light guide capable of monitoring large apertured areas.
  - 3
- 1 4. The system of claim 2 wherein the tube is a Teflon<sup>®</sup> tube modified for portable
  - 2 use as a survey instrument, the tube capable of being easily transported to areas of

3 interest.

1 5. The system of claim 1 wherein the neutron absorber component of the cocktail  
2 mixture is comprised of  $\text{LiBF}_4$  (lithium tetrafluoroborate).

1 6. The system of claim 1 wherein the neutron absorber component of the cocktail  
2 mixture is comprised of  $\text{LiCl}$  (lithium chloride).

1 7. The system of claim 1 wherein the neutron absorber component of the cocktail  
2 mixture is comprised of  $\text{NaBF}_4$  (sodium tetrafluoroborate).

1 8. The system of claim 1 wherein the scintillator component of the cocktail mixture is  
2 comprised of a tris complex of 2,6-pyridine dicarboxylic acid (dipicolinic acid)  
3  $\text{Li}_3[\text{Eu}(\text{DPA})_3]$ .

1 9. The system of claim 2 wherein the wavelength shifter component of the cocktail  
2 mixture is comprised of a rare earth chelate.

1 10. The system of claim 9 wherein the rare earth chelate is europium.

1 11. A liquid cocktail mixture for detecting the presence of neutrons comprising:  
2 a neutron absorber component; and  
3 a scintillator component.

1 12. The liquid cocktail mixture of claim 11 further comprising a wavelength shifter for  
2 converting light produced by the scintillator component to another wavelength.

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1 13. The liquid cocktail mixture of claim 11 wherein the neutron absorber component  
2 of the cocktail mixture is comprised of  $\text{LiBF}_4$  (lithium tetrafluoroborate).

1 14. The liquid cocktail mixture of claim 11 wherein the neutron absorber component  
2 of the cocktail mixture is comprised of  $\text{LiCl}$  (lithium chloride).

1 15. The liquid cocktail mixture of claim 11 wherein the neutron absorber component  
2 of the cocktail mixture is comprised of  $\text{NaBF}_4$  (sodium tetrafluoroborate).

1 16. The liquid cocktail mixture of claim 11 wherein the scintillator component of the  
2 cocktail mixture is comprised of a tris complex of 2,6-pyridine dicarboxylic acid  
3 (dipicolinic acid)  $\text{Li}_3[\text{Eu}(\text{DPA})_3]$ .

1 17. The liquid cocktail mixture of claim 12 wherein the wavelength shifter  
2 component of the cocktail mixture is comprised of a rare earth chelate.

1 18. The liquid cocktail mixture of claim 18 wherein the rare earth chelate is  
2 europium.